Associations between cardiorespiratory responses, perceived exertion and affect during isolated and triathlon-specific cycling time-trials

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Introduction

Compared to other cardiorespiratory parameters, respiratory frequency (f_R) is suggested as one of the most important contributors to self-paced endurance performance.

This is based on the strong relationship f_R shares with RPE, irrespective of event duration (Nicolò et al., 2016).

However, it is yet to be established if f_R and RPE interaction differs during multi-modal events (i.e. triathlon).

Indeed, the complexity of such exercise may well alter the relationships that are typically seen between perceptual and physiological status during single-mode events (Taylor & Smith, 2013).

Furthermore, it is suggested that a number of perceptual factors, including affective status, may be equally (if not more) important than RPE to the pacing of endurance performance.

However, the relative influence of perceptual mediators on the regulation of multi-modal (versus single mode) exercise intensity is yet to be fully elucidated.

Objectives

This study therefore examined the associations between cardiorespiratory responses, RPE and affect during isolated and triathlon-specific cycling time-trial (CTT) performance.

Materials & Methods

Eleven non-elite male triathletes (mean ± SD: age 36.9 ± 8.4 yrs, VO_{2max} 4.1 ± 0.3 L·min-1, W_{max} 344 ± 21 W)

Two separate 500kJ CTT's completed, one in isolation (CTT_{ISO}) and one as part of a simulated triathlon (CTT_{TRI}) (Figure 1).

Cardiorespiratory (f_R, V_E, VO_2, V_T, HR) and perceptual (RPE and affect) responses obtained during final 25kJ of each 100 kJ section

Relationships between perceptual and physiological measures examined via within-subject correlation coefficients (Bland & Altman, 1995).

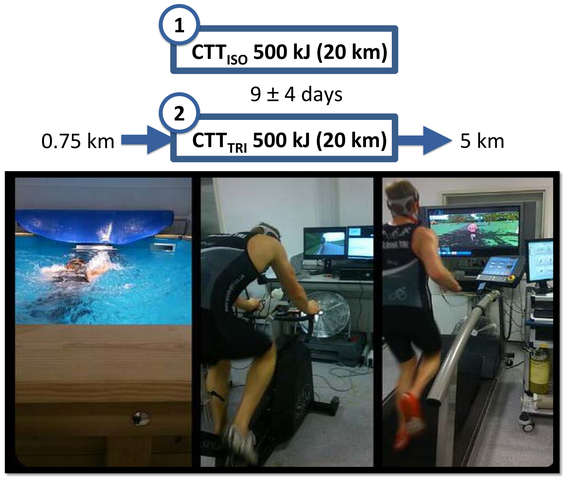

Figure 1. Summary of experimental trials and illustration of laboratory set-up, including (L-R) flume-based swim; ergometer-based CTT (SRM); treadmill-based run

Results

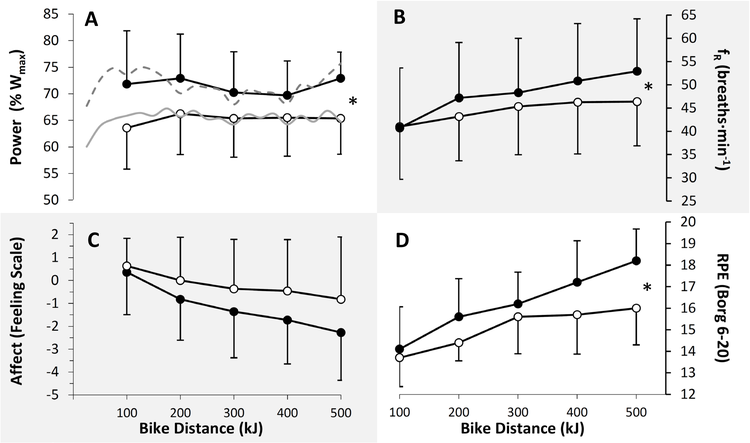

Figure 2. Group mean ± SD values during CTT_{ISO} (filled circles) and CTT_{TRI} (open circles) of (A) power output for each 100 kJ (solid lines) and 25 kJ (dashed lines) section, (B-D) f_R, affect and RPE for each 100 kJ section, respectively (main effect of trial $p < .05$ *).

Table 1. Within-subject correlation coefficients for both RPE and affect versus cardiorespiratory responses during CTT_{ISO} and CTT_{TRI} ($p < .05$ * ; $p < .01$ **)

	RPE		Affect	
	CTT_{ISO}	CTT_{TRI}	CTT_{ISO}	CTT_{TRI}
V_T	0.49**	0.43**	0.63**	0.60**
V_E	0.58**	0.03	0.37*	0.08
VO_2	0.57**	0.30*	0.26	0.09
HR	0.79**	0.51**	0.67**	0.43**

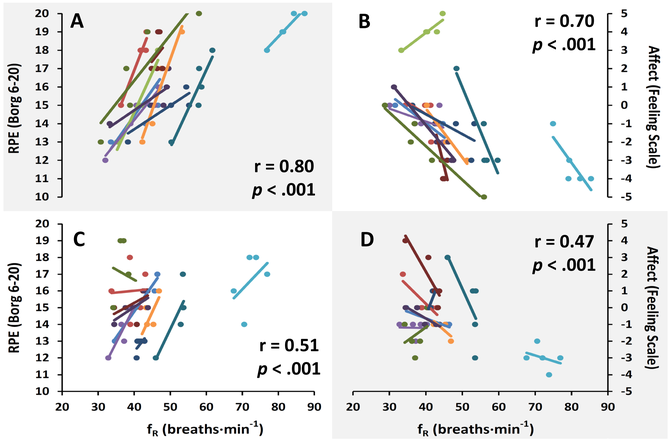

Figure 3. Within-subject correlation coefficients (and individual data) for RPE and Affect versus f_R during CTT_{ISO} (A and B, respectively) and CTT_{TRI} (C and D, respectively) ($p < .01$ **)

Discussion & Conclusions

f_R demonstrated the strongest relationship with RPE and affect across both CTT's, relative to other cardiorespiratory measures.

Strength of relationships between cardiorespiratory responses and affect generally lower compared to those seen with RPE.

Associations between perceptual and cardiorespiratory responses were consistently weaker during CTT_{TRI}.

f_R and RPE interaction may indeed be one of the most important contributors to pacing during both single and multi-modal events

Unique relationships appear to exist between perceptual and physiological responses during triathlon cycling, and warrant further examination

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